CHAPTER 3

Aircraft Configuration

3.1 INTRODUCTION

This chapter describes the procedures required to ready the aircraft for loading. These include application of power, operation of the cargo ramp and winch, installation of cargo roller rails, litter supports, and prepositioning of cargo tiedowns and barrier nets.

3.2 CARGO RAMP AND DOOR OPERATION

WARNING

Before raising or lowering the ramp, visually ensure that the ramp and ramp area are clear of personnel.

To open door:

1. BATTERY — AS REQUIRED.

NOTE

The battery must be ON for the HYDRAULIC MAINTENANCE PUMP switch at the FCCS to operate. The battery is not required to be ON to use the HYDRAULIC MAINTENANCE PUMP switches on the aft cabin control station or the external ramp control station.

2. HYDRAULIC MAINTENANCE PUMP switch — Actuate.

NOTE

The maintenance pump is only required when the APU or the main engines are not driving the MWGB, and theNo.3 hydraulic system is not operating.

3. DOOR switch or control lever — OPEN.

4. HYDRAULIC MAINTENANCE PUMP switch. and DOOR switch or control lever — Release to center position when door is fully opened.

To open ramp:

CAUTION

- Before lowering the ramp, ensure the ramp extensions are up, the area under the ramp is clear, and the ground is of equal load carrying capability to avoid twisting the ramp when loads are applied.

- Do not use the POWER DOWN plunger while the aircraft is on the ground. Failure to comply may result in damage to the ramp.

5. HYDRAULIC MAINTENANCE PUMP switch — Actuate.

6. RAMP switch or control lever — OPEN.

7. HYDRAULIC MAINTENANCE PUMP switch and RAMP switch or control lever — Release to center position when ramp reaches desired position.

8. BATTERY — OFF (if previously turned ON).

To close ramp and door:

9. HYDRAULIC MAINTENANCE PUMP switch — Actuate.

10. RAMP and DOOR switches or control levers — CLOSE

11. RAMP and DOOR switches or control levers — Release DOOR switch/lever when door is fully closed, and release RAMP switch/lever when ramp is fully closed.

12. HYDRAULIC MAINTENANCE PUMP switch — Release.

3.3 CARGO ROLLER RAILS

3.3.1 Roller Rail Conversion.

1. Press latch in on one end of roller rail until latch disengages.

2. Lift roller rail from floor channel and flip over.

3. Insert one end of roller rail into floor channel.

NOTE

The aft end of the aft cabin roller rails and the forward end of the ramp roller rails must be inserted into the floor channel first to engage channel pin into roller rail notch.

4. Place roller rail in floor channel and press down until latch(es) engage.

3.3.2 Guide Rail Deployment.

1. Remove guide rail from stowage position on cabin bulkhead.

2. Lift each knob on guide rail support fitting and rotate 1/4 turn.

3. Insert support fittings into floor tracks.

4. Turn knob on each support fitting 1/4 turn to lock guide rail in track.

3.3.3 [A] Roller Rail Conversion.

NOTE

All eight cargo roller rails are interchangeable, and each can be installed in any position.

1. Remove each roller rail from stowage position on cabin bulkheads by pulling lockpin and sliding each rail out.

2. Remove quick-disconnect pins, fold out rail guides, and reinstall quick-disconnect pins.

3. Align each roller rail with the floor receptacles, rail guides outboard, and slide rail (forward for left side rails or aft for right side rails) until spring loaded lockpin engages.

4. Tighten wing nuts to secure the each roller rail.

To stow roller rails:

5. Reverse steps 1 through 4.

3.4 LITTER SUPPORT INSTALLATION

1. Install each bulkhead attachment fitting at required position on WL 152 intercostal and secure with four bolts.

2. Engage stud fittings at base of stanchion assembly to outboard studs on deck.

3. Align upper portion of stanchion assembly to bulkhead attachment fitting and insert quick-release pin.

4. Engage stud fitting on bottom of litter support strap to inboard stud on deck.

5. Repeat steps 1 through 3 for second stanchion assembly.

6. Open support brackets to receive litter handles.

7. Place litter handles on support brackets.

8. Lock litter handles in place by engaging each litter support locking bar with locking bar catch and securing locking handle.

9. If required, level litters by using the upper and lower adjustment buckles on each support strap.

10. Repeat steps 1 through 9 for each litter tier to be installed.

3.5 TROOP SEATS

Prior to loading cargo, the troop seat bottoms should be placed in the stowed position and secured by the retaining straps. If a mixed load of cargo and troops is being carried, the required seats can be unstowed after the cargo has been loaded and secured.

3.6 CARGO WINCH

3.6.1 Cargo Winch Operational Check.

WARNING

- Winch cable may fray. Wear approved protective gloves when handling winch cable to prevent injury from frayed cable strands.
- Ensure personnel are clear of the winching cable and equipment prior to stating winching operations.

NOTE

Electrical and hydraulic power for operation of the cargo winch is provided by components on the MWGB. The MWGB may be driven by the main engines when the proprotors are turning, or by the APU when the rotors are stopped.

1. Cargo Ramp — Position as required.
2. Winch cable — Unstow.

Winch electrical control check:

3. On any MFD or CDU/EICAS press SYST (T5).
4. MAINT LAYER (R7) — Press.
5. SYST STAT (L1) — Press.
6. SEQ ↓ (L6) — Press to scroll down to EQUIP AND FURN.
7. WRA PRES STAT (L2) — Press.
8. Verify CABIN CONTR STATION is not F(P) in the STAT column.
9. FCCS HOIST/WINCH switch — WINCH.
10. H/WOG (at FCCS station) CABLE thumbwheel — OUT (slow rate with gradual increase).
11. Winch cable — Verify reels out smoothly, and speed changes with thumbwheel changes.

NOTE

- Maintain tension on cable while cable is being reeled in and out.
- The cable is colored orange for 20 ft. from maximum cable out and cable in positions. The orange color is provided to alert the winch operator to slow the extend or retrieve speed and to be prepared for the cable movement to stop.

12. Winch cable — Advance until the out limit switch is engaged.
13. Cargo winch — Verify at least 5 wraps of cable remain on winch drum.
14. H/WOG CABLE thumbwheel — IN (slow rate with gradual increase).
15. Winch cable — Verify reels in smoothly, and speed changes with thumbwheel changes.
16. Winch cable — Retract until approximately 50 ft. of cable is extended.
17. H/WOG — Disconnect from FCCS, and connect to aft cabin control station.
18. H/WOG CABLE thumbwheel — OUT (slow rate with gradual increase).
19. Winch cable — Verify reels out smoothly, and speed changes with thumbwheel changes.
20. Winch cable — Advance until approximately 100 ft. of cable is extended.
21. H/WOG CABLE thumbwheel — IN (slow rate with gradual increase).
22. Winch cable — Verify reels in smoothly, and speed changes with thumbwheel changes.
23. Cargo winch — Verify in limit switch stops winch with approximately 20 inches of cable extended.
24. FCCS WINCH/HOIST switch — OFF.

Winch manual control check:

25. Hoist/Winch module POWER knob — ON.
26. SELECT knob — WINCH.

27. MAN OVRD — DOWN. Hold until approximately 50 ft. of cable is extended.

28. Verify cable extends smoothly.

29. MAN OVRD — Release to center.

30. Verify cable stops when MAN OVRD released.

31. Pull on cable to verify winch brake operation. Cable shall not pull out.

32. MAN OVRD — UP. Hold until approximately 3 ft. of cable remains out.

33. Verify cable retracts smoothly.

34. MAN OVRD — Release to center.

35. POWER knob — OFF/NORM.

36. SELECT knob — HOIST/NORM.

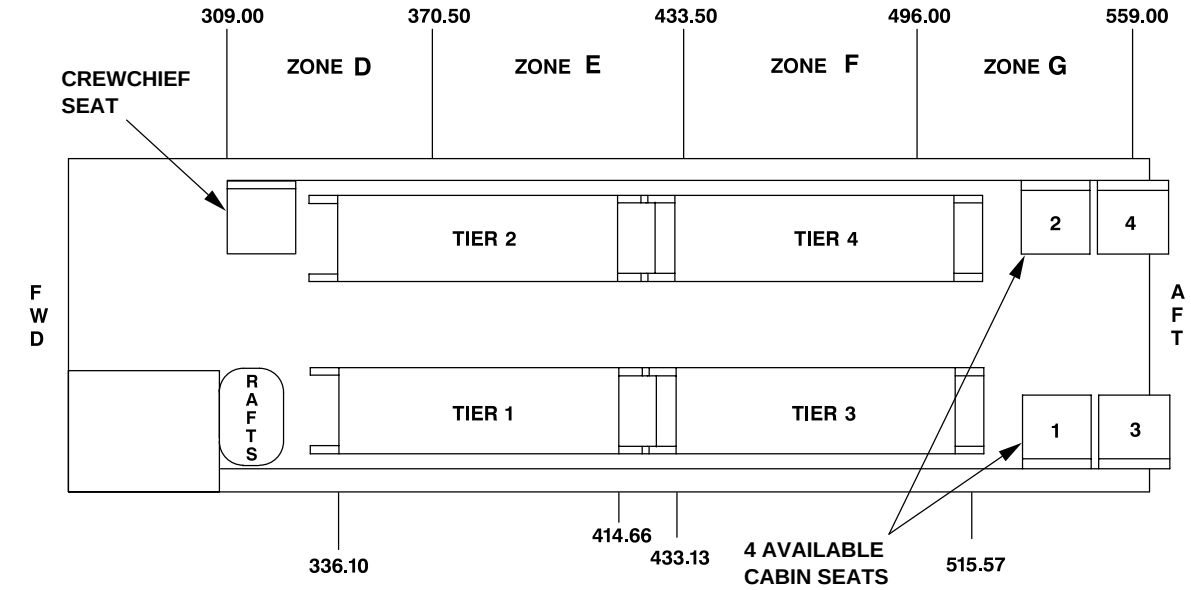
37. Winch cable — Stow.

3.7 AIRDROP SYSTEM INSTALLATION

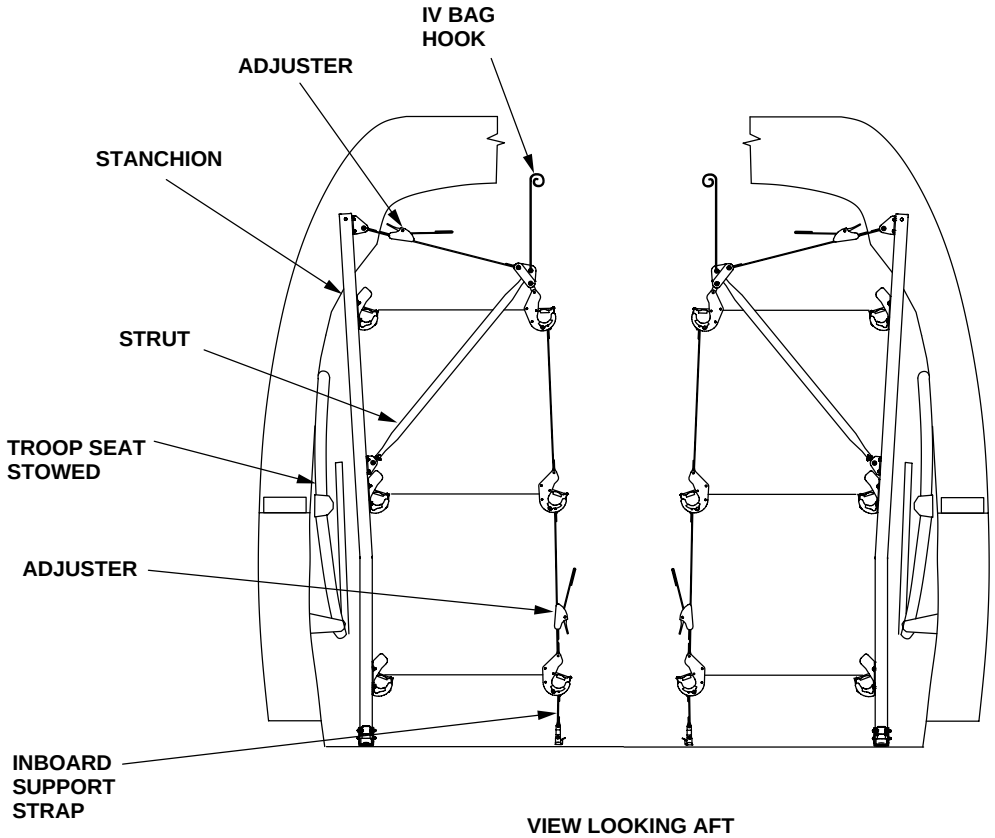
The airdrop kit consists of a release gate stanchion assembly, cargo guide rail vertical attachment fittings, and anchor lines (Figure 3-2). The airdrop kit stanchion assemblies are installed on the right cabin bulkhead at stations 336.1, 414.6, and 515.5, and use the same attachment points as the litter stanchions. The airdrop release gate system utilizes the hand crank on the forward stanchion. The hand crank is used to reel in the cable and provide sufficient tension on the cutter assembly to shear the release gate. The hand crank/reel assembly can be stowed via two quick-release pins to provide access to the crewchief's seat. The forward and aft beams are installed between stanchions and secured with quick-release pins. The cargo roller rails are deployed, and the cargo guide rails are deployed to the proper locations depending upon the width of the cargo to be airdropped. The vertical attachment fittings are installed on the cargo guide rails. The aft vertical retention fittings are provided in two different lengths. The shorter set is for use with 463L half-pallets, and the long set is for A7 or A21 pallets.

CAUTION

Short vertical attachment fittings shall be used for airdrop of 463L half-pallets. Long vertical attachment fittings shall be used for airdrop of A7 or A21 (skidboard) pallets. Failure to utilize the proper vertical attachment fittings may result in pallet jamming when the pallet transitions from the cabin roller rails to the ramp roller rails.



CABIN PLAN VIEW



VIEW LOOKING AFT

LITTER CONFIGURATION

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J2567

Figure 3-1. Litter Installation (Sheet 1 of 2)

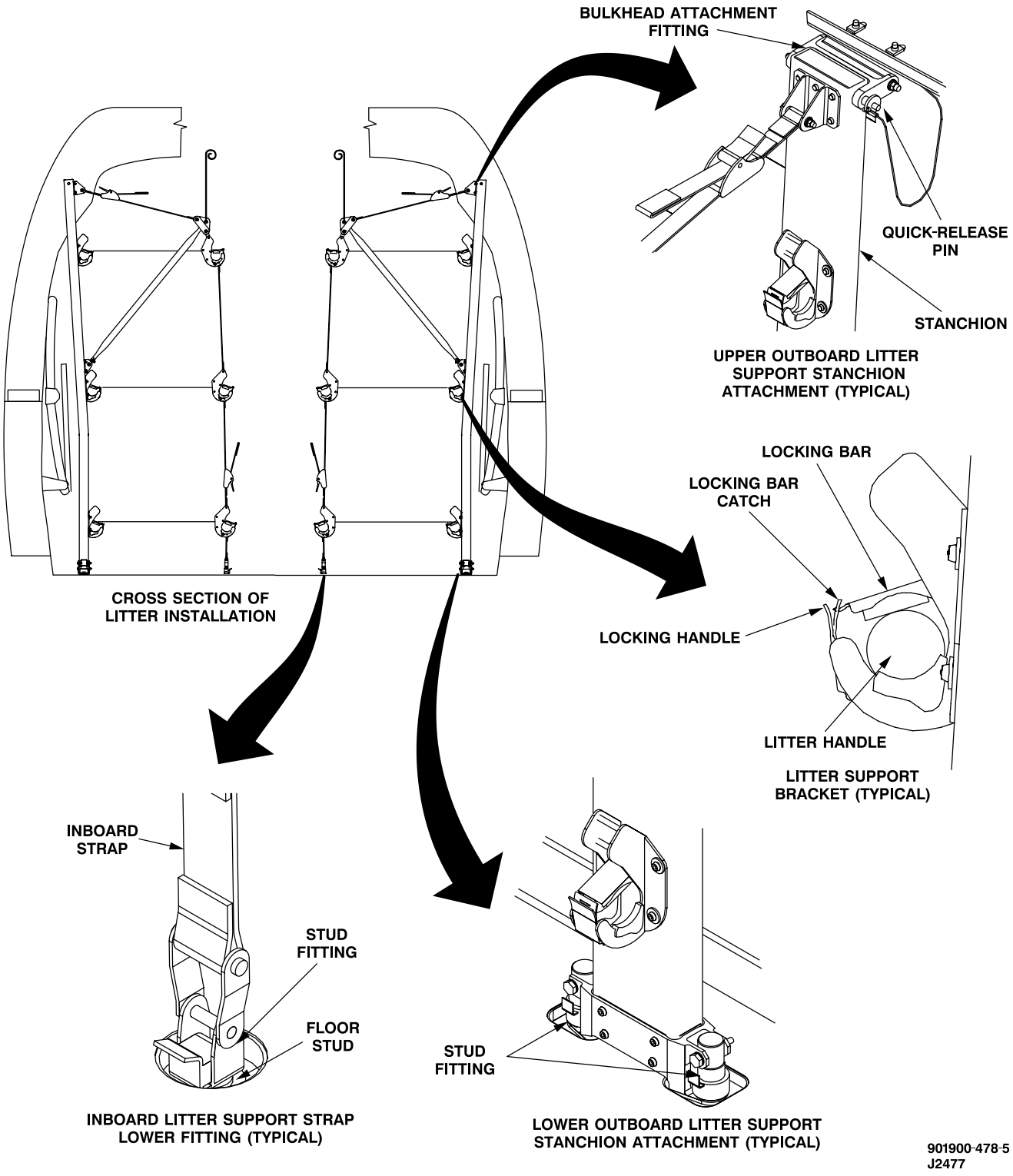


Figure 3-1. Litter Installation (Sheet 2 of 2)

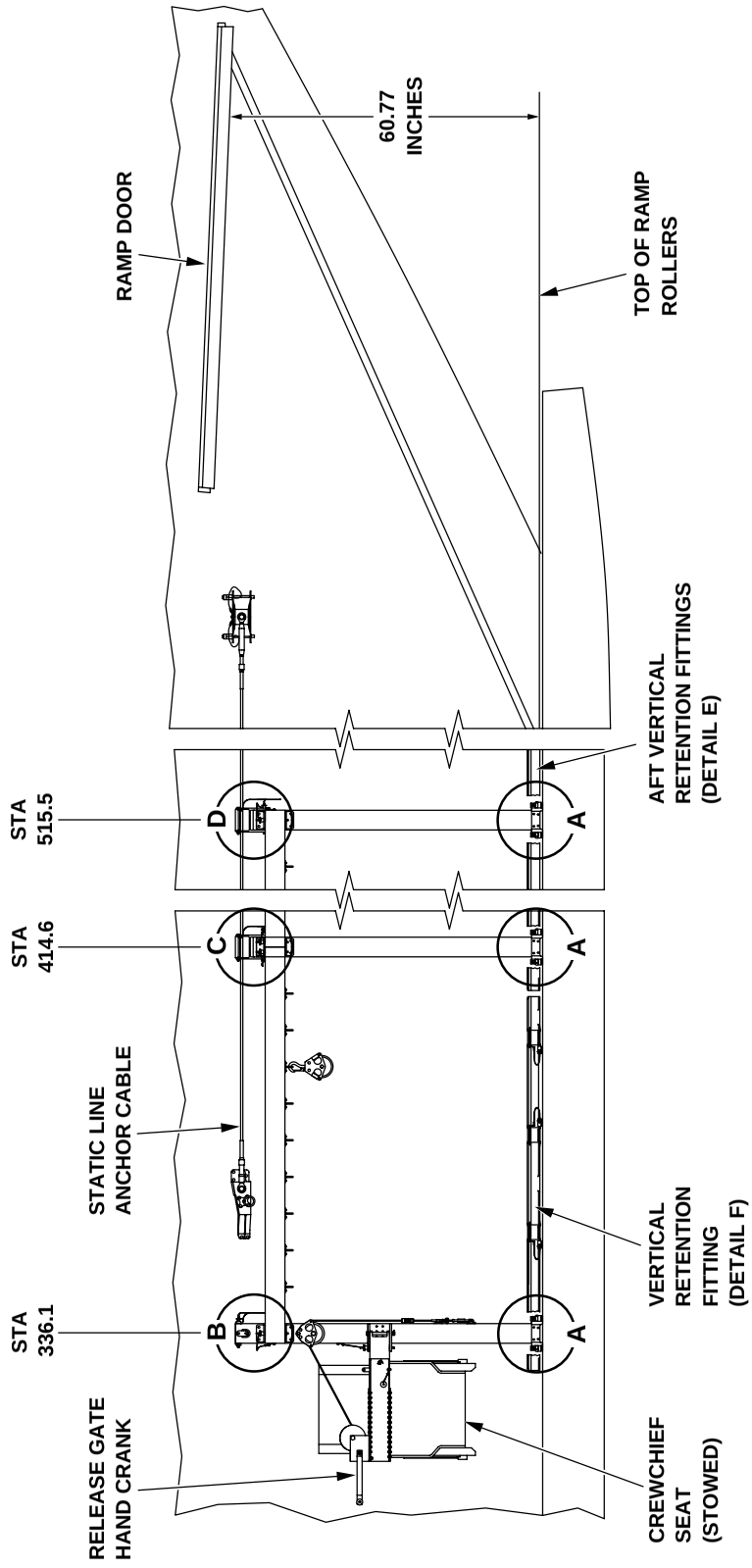
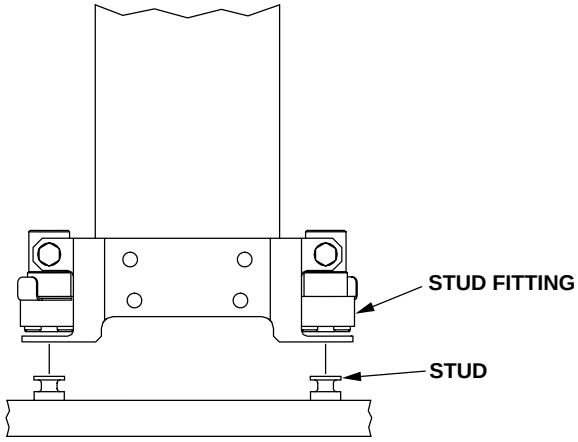
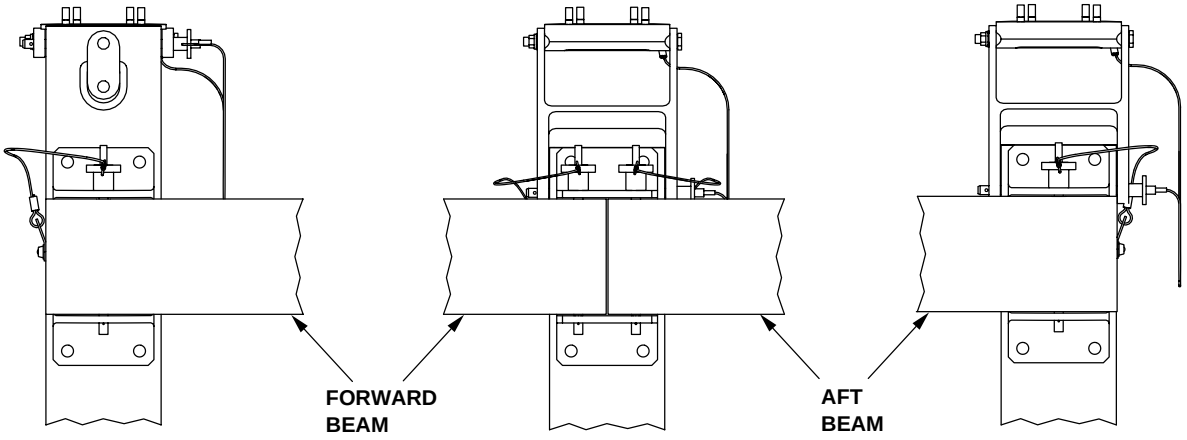


Figure 3-2. Airdrop Kit Installation (Sheet 1 of 3)



DETAIL A
STANCHION LOWER ATTACHMENT POINTS



DETAIL B DETAIL C DETAIL D
STANCHION UPPER ATTACHMENT POINTS

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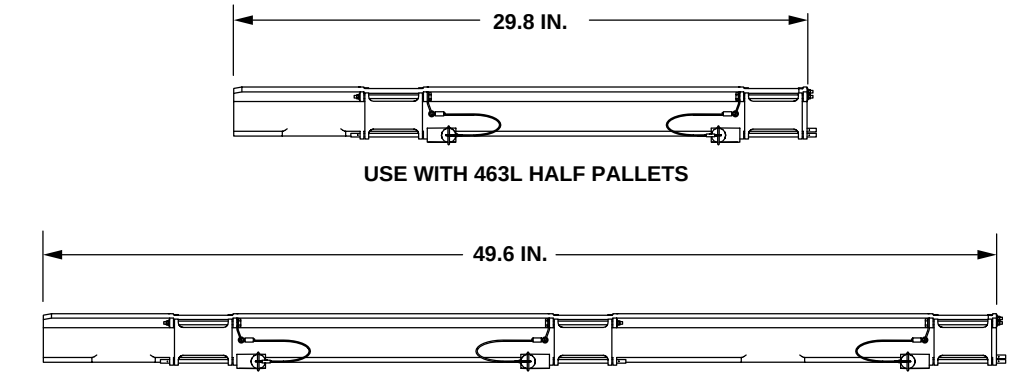
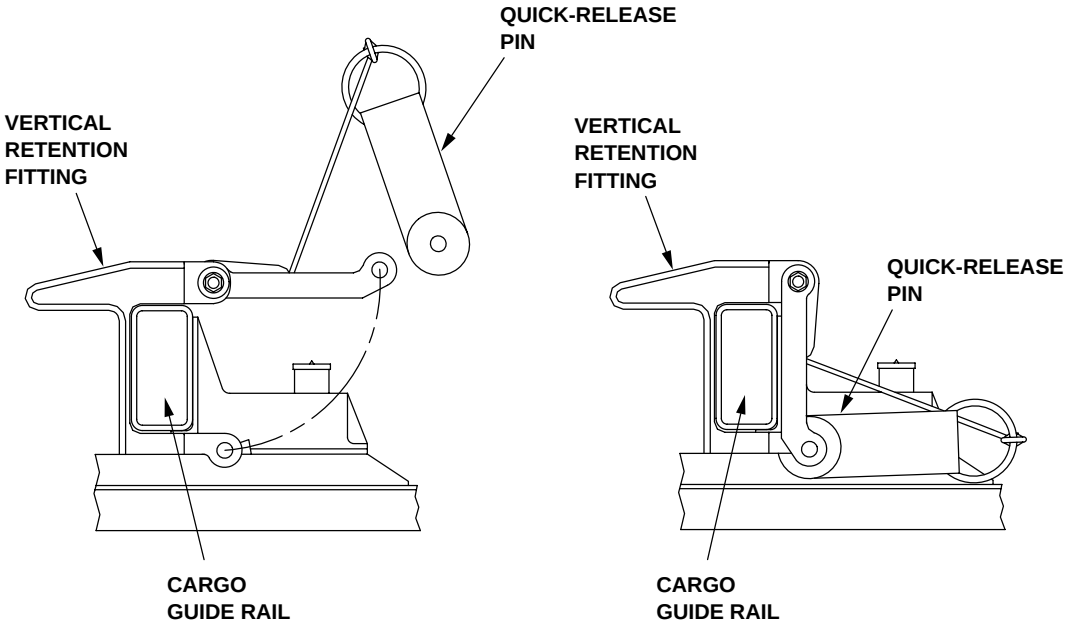
J3001

Figure 3-2. Airdrop Kit Installation (Sheet 2 of 3)



DETAIL E
AFT VERTICAL RETENTION FITTINGS



DETAIL F
VERTICAL RETENTION FITTING INSTALLATION

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J3001

Figure 3-2. Airdrop Kit Installation (Sheet 3 of 3)

CHAPTER 4

General Procedures (Operation)

4.1 INTRODUCTION

This chapter contains general instructions relative to load planning and loading, post-loading, and off-loading procedures. This information pertains to cargo which can be loaded and transported in the aircraft without the use of special handling procedures such as those described in Chapter 6, Specific Procedures. This chapter is divided into five categories:

a. LOAD PLANNING

b. LOAD METHODS AND RESTRAINT

c. WINCHING PROCEDURES

d. CHARTS AND GRAPHS

e. ON/OFF LOADING PROCEDURES

4.2 LOAD PLANNING

The three elements of proper aircraft load planning are weight, balance, and restraint. Cargo must be loaded in such a manner that the weight of the cargo remains within the carrying capacity of the aircraft, the balance of the aircraft remains within the operating limitations as defined in NAVAIR 01-1B-40, and the cargo is restrained from shifting during flight.

1. Weight. Each aircraft is weighed upon delivery, and periodically thereafter, to determine its basic (empty) weight. The weight of cargo that may be carried on any particular mission is found by adding to the basic weight, the weight of the crew, required fuel, oil, and other essentials, and subtracting the total from the allowable design gross weight. The cargo weight is also determined by its location in the aircraft and the strength of the cargo floor.

2. Balance. As does every object, the aircraft has a point about which it will balance. This point is known as the center of gravity (cg). Any item added or removed will cause a change of cg unless it was added or removed at the cg. If the cg is too far forward or aft the aircraft will develop unsafe flight characteristics. The location of the aircraft cg is expressed either by the fuselage station or as percent of Mean Aerodynamic Chord (MAC). Cargo must be loaded so that the cg of the aircraft is within the limits specified in NAVAIR 01-1B-40. The cargo load must be planned so that the cg of the loaded aircraft will be within the specified forward and aft limits for any given operating condition. A general rule for loading cargo into the aircraft is to position the heavy units in the area of the optimum aircraft cg, and position the lighter units forward and aft to balance the load.

3. Restraint. Cargo carried in the aircraft is subject to forces resulting from rough air, maneuvering, hard or crash landings, etc. Unless the cargo is tied down or restrained, these forces will cause the cargo to shift. Cargo shifting must be prevented in order to preserve aircraft balance during flight, and prevent injury to personnel caused by the moving cargo.

All cargo loads should be planned before actual loading into the aircraft. A cargo preparation and load planning checklist should be used. The degree of planning will vary with each operation, depending on the cargo to be loaded and the experience of the loading personnel. The method of loading should be considered and due regard should be given to the placement of cargo in the aircraft for rapid unloading/emergency jettison. The following basic factors must be considered in planning the placement of any cargo load.

a. Cargo must be loaded so that the cg of the loaded aircraft remains within the operating limits defined in NAVAIR 01-1B-40 and NAVAIR A1-V22AB-NFM-000 NATOPS Flight Manual.

b. Cargo must be loaded without exceeding the strength of, or damaging, the cargo floor.

c. Cargo must be arranged to permit free access to the emergency exits and equipment while in flight.

d. Bulk cargo must be properly stacked to prevent damage to fragile items.

e. The load should be arranged to permit rapid and secure tiedown of all items.

f. Boxes and crates should be loaded in accordance with any instructions marked on them.

4.2.1 General Weight and Balance Requirements. The aircraft cg is the point around which the aircraft will balance longitudinally. It is essential that the cg be located within the specified limits. The flight performance of the aircraft depends on the location of this point. As fuel, oil, cargo, and other weights are added, removed, or relocated within the aircraft, the aircraft cg changes. The aircraft is designed to permit such cg changes, provided the cg location remains within certain specified limits. Instructions for calculating the cargo cg are contained in this section of the manual. After the cargo cg is determined, refer to NAVAIR 01-1B-40 for instructions on determining the aircraft cg.

4.2.2 Cargo Placement Planning. If cargo is loaded so that the total cargo cg falls within the VTOL limits, the cg of the loaded aircraft will generally be within the specified operating limits in both the VTOL and airplane modes. Prior to actual loading, the location of the individual items should be planned and a check made to determine if this arrangement is satisfactory. The detail planning procedure consists of two steps:

1. Select locations in the aircraft, and the manner in which the cg of the load is to be determined. The cg can be computed by either the compartment or station method:

   a. Compartment Method. Each item of cargo is assigned to one of the four cargo compartments (zones). This method is suited to loads consisting of several items or pallets whose cg is unknown.

   b. Station Method. The cg of the cargo item is located at a specific fuselage station. The station method is more accurate and is normally used when the load consists of a few large items whose cg is marked on the container.

2. Determine the cg of the cargo load. Final weight and balance of the cargo, after it is loaded into the aircraft, must always be determined in accordance with NAVAIR 01-1B-40.

4.2.2.1 Cargo cg By Compartments. The compartment method provides a rapid means of computing the cg of the load, and should be used when the cargo load consists of a number of items. The cabin is divided into four cargo compartments (zones) identified as D, E, F, and G.

NOTE

Zones A thorough C are crew positions. Zone H is the cargo ramp.

When using the compartment method, it is assumed the weight of all the cargo in the compartment is concentrated at the centroid of the compartment. If an item is placed so that it extends into two compartments the weight of the item should be proportionally distributed to each compartment. The cg of the cargo load is calculated as follows:

1. Record the weight of cargo in each compartment.

2. Multiply the total weight in each compartment by the station number of the centroid. The result is the compartment moment. Figure 4-1 provides compartment moment/1000 for the full range of weights.

3. Add the compartment moments.

4. Add the weights of the cargo.

5. Divide the total moment from step 3 by the total cargo weight from step 4.The result is the fuselage station of the cargo cg.

ZONE	D	E	F	G
CENTROID	347	405	473	528
WT (LBS)	MOMENT/1000 AT CENTROID			
5	2	2	2	3
10	4	4	5	5
20	7	8	9	11
30	10	12	14	16
40	14	16	19	21
50	17	20	24	26
60	21	24	28	32
70	24	28	33	37
80	28	32	38	42
90	31	36	42	48
100	35	40	47	53
200	69	81	95	106
300	104	122	142	158
400	139	162	189	211
500	174	203	237	264
600	208	243	284	317
700	241	284	331	370
800	278	324	378	422

(TABLE I.D. 922060)

Figure 4-1. Compartment Moments

ZONE	D	E	F	G
CENTROID	347	405	473	528
WT (LBS)	MOMENT/1000 AT CENTROID			
900	312	365	426	475
1000	347	405	473	528
1500	521	608	710	792
2000	694	810	946	1056
2500	868	1013	1183	1320
3000	1041	1215	1419	1584
3500	1215	1418	1656	1848
4000	1388	1620	1892	2112
4500	1562	1823	2129	2376
5000	1735	2025	2365	2640
5500	1907	2228	2602	2904
6000	2082	2430	2838	3168
6500	2256	2633	3075	3432
7000	2429	2835	3311	3696
7500	2603	3083	3548	3960
8000	2776	3240	3784	4224
8500	2950	3443	4021	4488
8600	2984	3483	4069	4541
8700	3019	3524	4115	4594
8800	3054	3564	4162	4646
8850	3071	3584	4186	4673
NOTE: Zones A through C contain crewmember seating provisions. Cargo zone H is the cargo ramp. These areas are not normally used for cargo.				

(TABLE I.D. 922060)

Figure 4-1. Compartment Moments

4.2.2.2 Cargo Cg By Stations. The station method provides a more precise cargo cg. This method should be used when the load consists of only a few large items of cargo. In order to use this method the cg of each item must be known. The cg of each cargo item will be located at a specific fuselage station. The cg of the load is calculated as follows:

1. Set up a table and record the weight of each item and the fuselage station of each item's cg

2. Calculate the moment of each item. This is accomplished by multiplying the weight of the item by the station number of it's cg location.

3. Add the moments to obtain the total cargo moment.

4. Add the weights to obtain the total cargo weight.

5. Divide the total moment by the total weight to obtain the location of the cargo cg.

4.2.3 Cargo Compartment Concentrated Floor Loads. The allowable concentrated floor loads are dependant upon the size, shape, and type of material which make up the floor contact area. These limitations are in addition to the overall limitations. Cargo roller rail strength is 1,000 lbs per linear foot with the cargo on both left and right rails.

4.2.3.1 Load Limits for Pneumatic Tires. Refer to Figure 4-3.

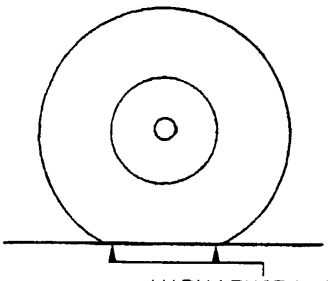
4.2.3.2 Load Limits for Hard Rubber Tires/Rigid Wheels. Limitations TBD. When vehicles with hard rubber tires, or steel wheels/casters, are rolled onto the cargo floor, stresses are created that are far more critical than those created by vehicles with pneumatic tires. The pressure is concentrated along a thin ribbon of contact at each wheel. Length of this ribbon, or width of the tire, limits the allowable load per wheel.

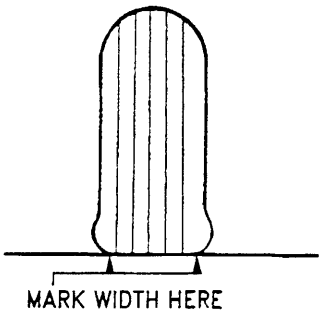
4.2.4 Shoring. Shoring is required for both weight/load distribution and cargo deck protection. Direct shoring is used to spread concentrated or heavy loads imposed by small steel wheels, casters, short skids, etc., over a larger area of the deck. This type of shoring consists of plank of heavy plywood placed on the cargo deck. Shoring for protection of the cargo deck is similar to direct shoring, except that the thickness of shoring material to be used is less. Deck protection shoring is not suitable for weight/load distribution.

4.2.4.1 Weight Distribution. The weight of a load resting on shoring is not spread equally over the entire area of contact between the shoring and the deck on which the shoring is resting. In general, shoring will only increase the area over which a load is distributed to whatever area is encompassed by extending a plane drawn downward and outward from the peripheral line of contact of the load on the shoring, at a 45-degree angle, until it intersects the deck on which the shoring rests (Figure 4-4).

4.2.4.2 Footprint Area Increase. The spreading effect of shoring is the same regardless of the shape of contact. The shoring enlarges the area of weight/load distribution of the footprint by the same directly proportionate shoring thickness to area-increase rule. Shoring will be longer than the footprint to ensure that it extends over at least two fuselage support frames and wide enough to provide a safe runway for wheeled or castered cargo.

4.2.4.3 Sleeper Shoring. Sleeper shoring is used to prevent vertical movement of a vehicle where the tires of suspension system cannot with stand g loads without failure or depression producing slack in the tiedown devices. This can cause a whipping action on the tiedown device resulting in a potential failure. A tire failure could result in the wheel rim contacting the





STEP 1

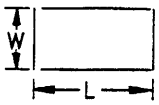
PARK THE VEHICLE ON A FLAT SURFACE.

STEP 2

PLACE MARKS ON THE SURFACE AS ILLUSTRATED.

STEP 3

MOVE THE VEHICLE. THE MARKS SHOULD APPEAR LIKE THIS:



STEP 4

SINCE THE ACTUAL PAD PATTERN IS ELLIPTICAL IN SHAPE, USE THE FOLLOWING FORMULA TO DETERMINE PAD AREA:

$A = 0.785\ LW$

A = AREA
L = LENGTH
W = WIDTH

EXAMPLE PROBLEM:

ASSUME THE VEHICLE WHEEL PAD IS 12 INCHES LONG AND 6 INCHES WIDE.

A = 0.785 X 12 X 6
A = 56.5 SQUARE INCHES

STEP 5

THE WHEEL LOAD MUST BE KNOWN TO DETERMINE THE PSI EXERTED BY THE TIRE ON THE PAD AREA. THE FORMULA FOR WHEEL LOAD IS:

$$\frac{\text{AXLE WEIGHT}}{\text{NUMBER OF WHEELS}} = \text{WHEEL LOAD}$$

EXAMPLE PROBLEM:

ASSUME THE AXLE WEIGHT IS 2,000 POUNDS AND THAT THERE ARE TWO WHEELS.

$$\frac{2{,}000}{2} = 1{,}000 \text{ POUNDS WHEEL LOAD}$$

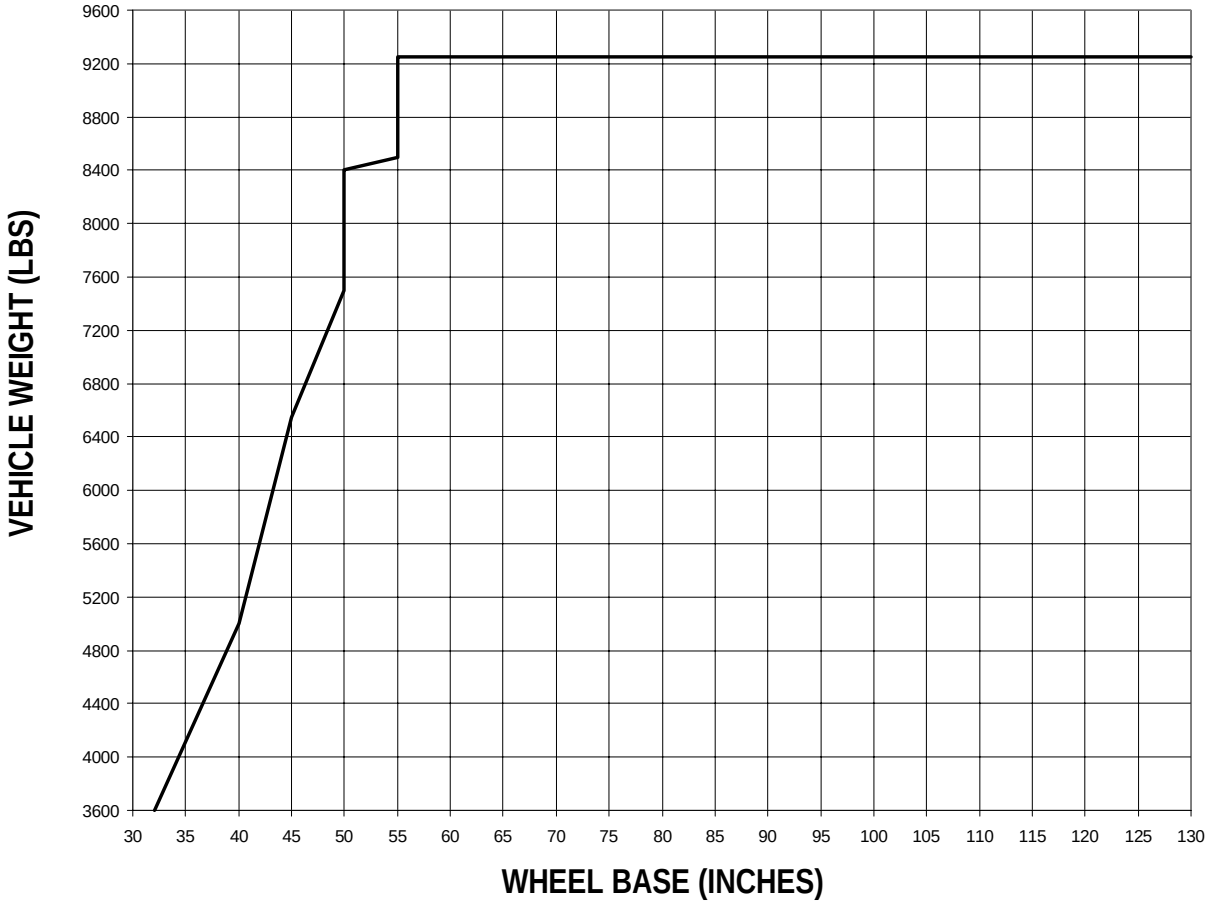
USING THE PAD AREA DETERMINED IN STEP 4 AND THE WHEEL LOAD ABOVE, USE THE FOLLOWING FORMULA TO DETERMINE THE PSI FLOOR LOADING:

$$\frac{\text{WHEEL LOAD}}{\text{PAD AREA}} = \text{FLOOR LOAD (PSI)}$$

$$\frac{1{,}000 \text{ POUNDS}}{56.5 \text{ SQUARE INCHES}} = 17.7 \text{ PSI}$$

Figure 4-2. Pneumatic Tire Pad and PSI Formula

CARGO RAMP



1. DETERMINE VEHICLE WEIGHT
2. DETERMINE WHEEL TRACK AND BASE
3. DETERMINE TIRE FOOTPRINT

NO SHORING REQUIRED FOR ANY TIRE FOOTPRINT IF: VEHICLE GROSS WEIGHT ≤ 3600 LBS,
AND WHEEL TRACK ≥ 48 INCHES,
AND WHEEL BASE ≥ 32 INCHES,
AND TIRE CONTACT PRESSURE ≤ 50 PSI.

OTHERWISE, ALUMINUM C-CHANNEL SHORING REQUIRED.

FOR VEHICLE GROSS WEIGHT GREATER THAN 3600 LBS, OR TIRE CONTACT PRESSURE GREATER THAN 50 PSI, ALUMINUM C-CHANNEL SHORING REQUIRED FOR THE FOLLOWING CONDITIONS:

Tire Footprint < 46.25 inches²	**46.25 inches² ≤ Tire Footprint ≤ 110 inches²**	**Tire Footprint > 110 inches²**
Wheel Track ≥ 48 inches Wheel Base ≥ 32 inches Maximum Gross Weight = 9250 lbs.	Wheel Track – No restriction Wheel Base ≥ 32 inches Use Chart for Maximum Gross Weight Limitation	Wheel Track ≥ 48 inches Wheel Base ≥ 32 inches Maximum Gross Weight = 9250 lbs.
NOTE: If Wheel Track < 48 inches Or Wheel Base < 32 inches Cannot Put Vehicle on Ramp		**NOTE:** If Wheel Track < 48 inches Or Wheel Base < 32 inches Cannot Put Vehicle on Ramp

Figure 4-3. Pneumatic Tire Loading Limitations (Sheet 1 of 2)

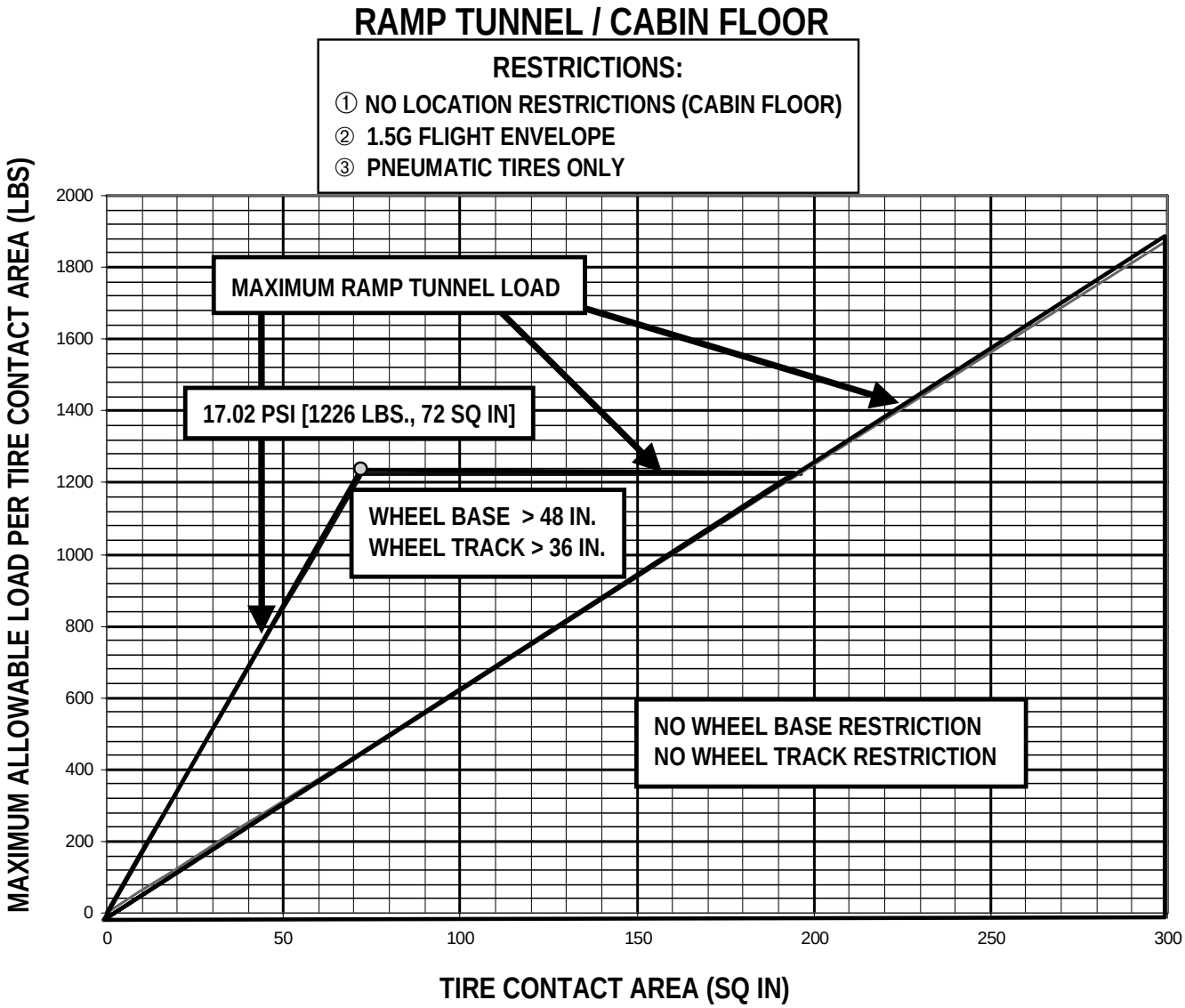


Figure 4-3. Pneumatic Tire Loading Limitations (Sheet 2 of 2)

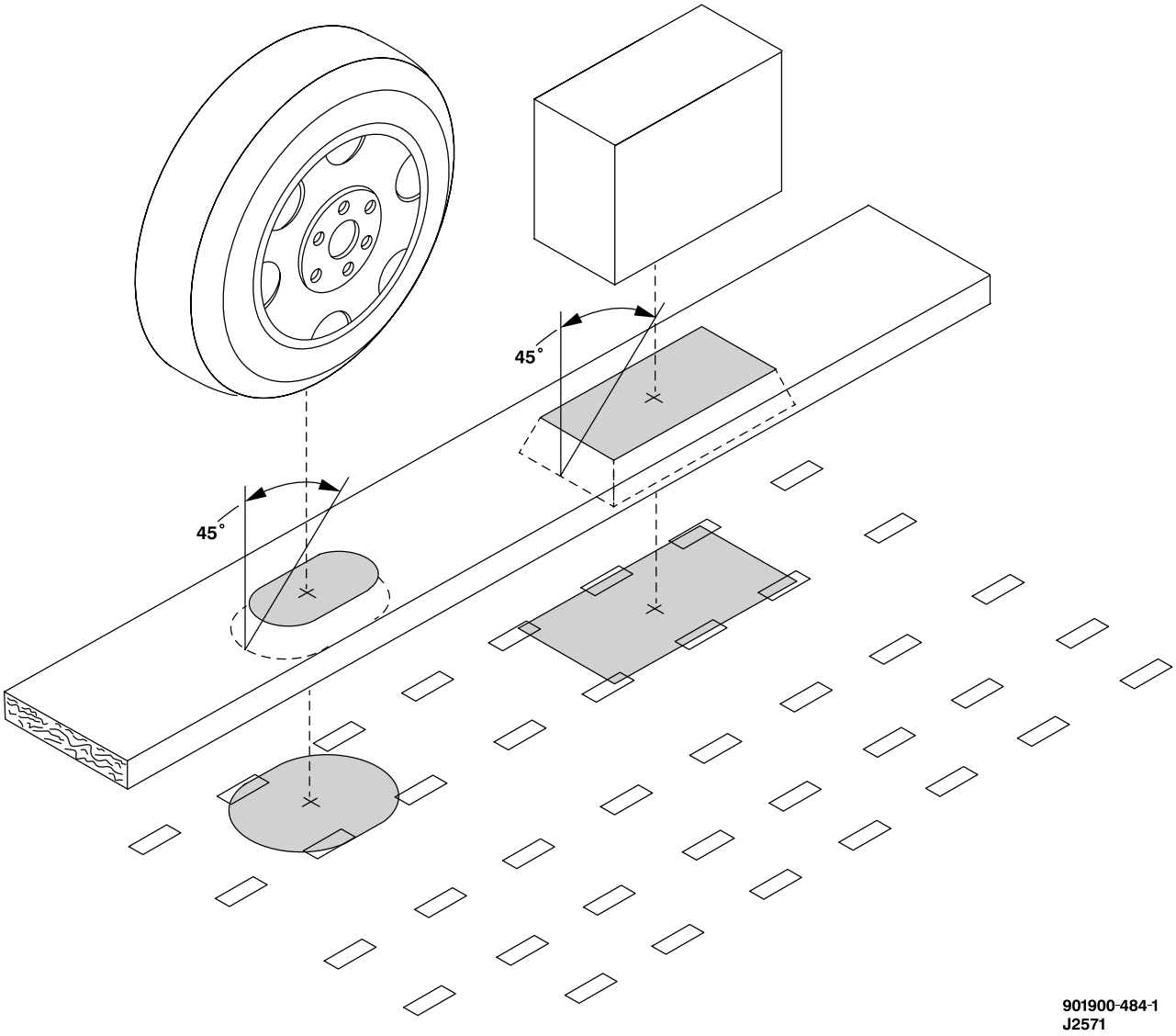


Figure 4-4. Effect of Cargo Shoring

aircraft floor, and causing damage to the aircraft. This type of shoring is placed between the aircraft floor and a structural part of the vehicle such as the frame of axels. It can also be used between various parts of equipment that are spring mounted to prevent their movement during flight.

4.3 LOAD METHODS AND RESTRAINT

4.3.1 Vehicle Loading. The dimensions of the vehicles should be checked prior to attempted loading into the aircraft. Some vehicles can be reduced in size by removing tops of deflating tires to the minimum required pressure.

4.3.1.1 Vehicle Preparation. The following should be completed when preparing vehicles for loading:

1. Determine overall dimensions of vehicle to assure it can be loaded.
2. Determine weight of vehicle.
3. Determine wheel load of vehicle (Figure 4-2).
4. Determine center of gravity for vehicle.
5. Fold mirrors, windshields, tail gates, and antennas.
6. Secure loose equipment in vehicle.
7. Limit amount of fuel in each gas tank to three quarters of it's capacity to prevent fuel from being forced out filler neck while in flight.
8. Tighten all gas caps, battery caps, and oil filler caps.
9. Check vehicle brakes.

4.3.1.2 Vehicle Loading Procedures. Vehicles may be loaded into the aircraft under their own power (engine or winch), or by use of the aircraft winch. Refer to Figure 4-26 for hand signals to be used for loading.

1. Stow troop seats, cargo roller rails, and deploy buffer boards.
2. Align vehicle carefully with ramp extenders.
3. Drive or winch vehicle up ramp, and into aircraft ensuring that adequate clearance remains on both sides and top/bottom of vehicle.
4. Position vehicle at proper position inside aircraft.

After vehicle is positioned, check:

5. Vehicle ignition off.
6. Parking brakes set.
7. Springs chocked when applicable
8. Wheel chocks in place when required.

WARNING

If vehicle fuel is spilled, discontinue use of cargo winch and all electrical equipment which may possibly spark and cause fuel to ignite, ventilate cargo compartment, and clean up spilled fuel.

4.3.1.3 Vehicle Loading Special Considerations.

a. If vehicle is backed into aircraft, the vehicle driver must follow instructions of guide, and not attempt to judge clearances himself. Prearranged maneuvering signals must be clearly understood (Figure 4-26).

b. Trailers are difficult to back up the ramp into the aircraft. To aid in loading, trailers should be winched into aircraft whenever possible.

CAUTION

When winching trailers, it is necessary to steer either with the winch or manually. Tongue of trailer should by handled manually or otherwise supported to prevent damage to the cargo floor.

c. When loading vehicles without brakes, wheel chocks should be immediately available to prevent equipment from rolling beyond it's loading position.

4.3.2 Palletized Cargo Loading. When possible, load small items of cargo on pallets before loading them into the aircraft. When this is done, the loading/unloading time is reduced, and the load is more easily secured in the aircraft. Observe the following precautions when loading palletized cargo:

a. Secure items loaded on pallets to the pallet, in the correct manner, for ease of handling and tie-down in the aircraft.

b. Determine the weight of the loaded pallet prior to loading it into the aircraft, so that the weight and balance calculations can be made.

c. Do not overload the pallet. The loaded pallet must not exceed the cargo floor limitations.

d. Dense, crated, or boxed cargo shall be loaded on the pallet first. Crushable or light density cargo shall be stacked on top of other cargo.

4.3.2.1 Pallet Cargo Loading Preparation.

Prepare the aircraft for pallet loads as follows:

1. Ensure that the troop seats are properly stowed.
2. Deploy ramp and cabin roller rails.
   a. **[A]** Rbl 25.56 and lbl 8.91 for 40 x 48-inch pallets
   b. **[A]** Rbl 25.56 and lbl 22.60 for 54 x 88-inch pallets.
3. Deploy cargo guide rails.
4. Install pallet stop(s) on forward roller rail.
5. Position tiedown straps at pre-selected fitting locations.
6. Position the barrier net as required for forward restraint.
7. Position ramp/open door as required
8. Install ramp roller rail extensions as required.

4.3.2.2 Pallet Loading Procedure.

1. Position the fork lift aft of the cargo ramp with the pallet aligned with the roller rails.
2. Adjust the height of the load to clear the ramp rollers and surrounding structure.
3. Monitor the clearance between the aircraft and cargo/forklift.

CAUTION

Ensure adequate clearance is maintained between the cargo/forklift and the aircraft.

4. Advance the forklift and lower the pallet onto the rollers.
5. Winch or manually position pallet.
6. Secure the cargo using tiedown straps and barrier net(s).

4.3.3 Troop Loading.

NOTE

When cargo is to be carried with troops, the troops should sit aft of the cargo (if cg permits). When troops are to be carried with litters installed, the troops should sit aft of the litters, or the litters and troops should be placed on opposite sides of the cabin (if cg permits).

4.3.3.1 Cabin Preparation. Prior to loading troops, the following checks shall be made:

1. Stow cargo roller rails.
2. Stow cargo guide rails.
3. Install proper number of troop seats.
4. Check troop seat harnesses.
5. Clear cabin of unnecessary items.
6. Clear ramp and door.
7. Ensure emergency equipment is installed and checked.
8. Ensure troop flotation vests are available (if required).
9. Ensure head protection (Cranials) available.
10. Ensure hearing protection available.
11. Open cargo ramp and door.
12. Brief troops (refer to A1-V22AB-NFM-000).

4.3.3.2 Troop Loading Procedures. Direct troops during loading of aircraft as follows:

1. Direct troops up ramp to proper seats.
2. Seat troops, and direct them to fasten harnesses.

NOTE

If flotation vests are required, vests shall be put on prior to fastening seat harnesses.

3. Check for proper use of cranials, helmets, sound attenuators, flotation vests, and seat harnesses.
4. Ensure that nothing is stowed under troop seats, including feet/legs.

WARNING

Troop seats stroke downward to the cargo deck to absorb crash impact forces. Do not stow equipment under seats. Failure to comply may result in personnel injury or death.

5. Notify crew that troops are loaded
6. Close ramp/door when directed by crew.

4.3.4 Restraint Criteria. Cargo may be subjected to forces resulting from flight in rough air, accelerations caused by flight maneuvers, and rough or crash landings. These forces act more strongly in some direction than in others, and will shift the cargo unless it is properly restrained. Since the aircraft and cargo both move forward rapidly during normal operation, the cargo will tend to keep on moving if the aircraft is suddenly slowed or stopped. This forward force is likely to be the strongest force acting on the cargo, but the cargo must also be secured against the forces acting upon it laterally, vertically or in an aft direction. The amount of restraint that must be used to keep the cargo from moving in any direction is called the "restraint criterion," and is expressed in units of the force of gravity, or g's. The following dynamic (for loads secured with attenuated devices) and static (for loads secured with unattenuated devices) restraint criteria have been established for this aircraft:

DIRECTION	DYNAMIC (ATTENUATED)
FORWARD	16 g's
AFT	5 g's
VERTICAL	5 g's
LATERAL	10 g's

In all of the above cases, this actually means that the force exerted by the object of cargo to be restrained may be as much as it's normal weight times the number of g's of the restraint criterion. For example, an object weighing 1,000 lbs. may, if the aircraft is suddenly stopped, tend to move forward with a force of 16,000 lbs. For the object to be safely transported, the restraints applied shall be equal to, or greater than these amounts.

4.3.5 Tiedown Devices. The aircraft is supplied with tiedown straps, barrier nets, and load attenuators which are used to restrain cargo. Each restraint has a rated strength. This is the load, or force, which it is designed to withstand. When these devices are properly used in conjunction with tiedown rings, the cargo will be restrained in all directions.

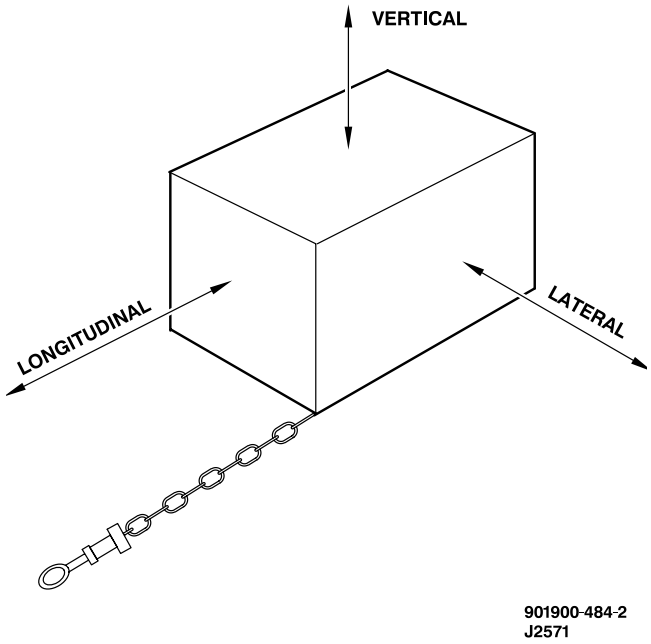


Figure 4-5. Tiedown Attached to Cargo

4.3.6 Effects of Applying Restraint at Angles. Every tiedown device has a rated strength which it is guaranteed to withstand. However, it will withstand this force only when the force is exerted parallel to the